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CENTRALIZED COMMAND – DECENTRALIZED EXECUTION:  
IMPLICATIONS OF OPERATING IN A  
NETWORK CENTRIC WARFARE ENVIRONMENT

by

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## *Abstract*

Advances in technology have brought about many changes to the employment of force. Information Operations and Network Centric Warfare significantly enhance situational awareness throughout the command hierarchy and provide an avenue for the highest levels to view battlefield actions as they develop. These changes have a great impact on the leadership of military forces. The line between Centralized Command and Decentralized Execution has at times become blurred, and there is grave potential for leaders to attempt to execute the battles at the major command levels. A thorough understanding of command relationships and leadership principles at the strategic, operational, and tactical levels of conflict, coupled with increased education on the benefits and dangers of technology and information systems are required to maintain effective force employment and achieve the asymmetric effects that Network Centric Warfare can create.

# INTRODUCTION

*There is no one fusing of information that meets the needs of all warriors. However, with concise, accurate, timely, and relevant information, unity of effort is improved and uncertainty is reduced, enabling the force as a whole to exploit opportunities and fight smarter.*

—Joint Publication 6

Recent advances in technology are transforming the military forces. Significant developments in information technology and data exchange systems are leading to more accurate and timely information exchange throughout the world, resulting in greater precision in weapons employment. The future vision for military operations exploits technology to shorten the traditional Observe, Orient, Decide, and Act (OODA) loop,<sup>1</sup> thereby reaping significant benefits in bringing force to bear on an adversary. Proper integration of a new warfare triad (information technology, improved sensors and weapons systems, and leadership elements at all levels of command) bring the military forces of the 21<sup>st</sup> century the promise of enhanced situational awareness, improved flexibility, and more lethality, while continuing to minimize fratricide and loss of innocent civilian life.

## **Tomorrow's Vision**

Network Centric Warfare (NCW), information superiority, effects based operations, and asymmetric warfare are the latest “buzzwords” highlighting the “transformation” theme. What is the impact of this transformation process on the warfighters? The force structure of tomorrow will operate with intimately interconnected weapons systems and sensors. Technology has reached a point where all commanders can “virtually” be on the front lines of combat. A

common operating picture depicting the front line battlefield actions and effects almost instantly at all levels of command will be the standard. The Commander-in-Chief through the civilian-political structure, and the Combatant Commands down to the component and unit levels, may all view the same data, which can be merely seconds old. This network of information, increased knowledge and resulting increase in capability not only offers many opportunities to enhance the execution of armed conflict but also presents many opportunities for failure. The risk is, the more virtual the battlefield presentation becomes, the easier it is for the chain of command to execute the battle from behind the computers and information systems.

Each service has prospered and been defeated in combat as a result of the control and execution of the use of force. Each brings unique strengths and different visions of how to accomplish a mission. The Navy has operated under the Composite Warfare Commander Concept for decades, with the understanding that “Command by Negation” is key to operating and accomplishing the mission.<sup>2</sup> The Air Force has adopted the phrase “Centralized Command, Decentralized Execution” and has proceeded to fight based on the trust and flexibility given to the lowest levels for executing the mission while maintaining the strategic and operational focus, coordinating and commanding campaigns and operations at the “component” level.<sup>3</sup>

Losing focus on the decision making process may result in longer decision timelines, less flexibility, loss of situational awareness, frustration, and possibly defeat. We have only to look back to some of the post-Desert Storm conflicts of the 1990s for illustrations of failure to effectively employ the military. The tragedy of Task Force Ranger in October 1993 in Somalia resulted in large part from senior political leaders denying a request by the Combatant Commander for proper equipment to carry out the mission in rising threat conditions.<sup>4</sup> The execution of the Kosovo air campaign likewise provides lessons on command interference and

decision making. Although some say we won the conflict in Kosovo, the lessons regarding decisions being made at higher headquarter and national political levels regarding execution of force highlight frustration within the military and excessive loss of life through a prolonged campaign. One can say that Kosovo was fought from inside the political arena in the United States and the equivalent in the NATO nations. Execution of the conflict was controlled from the higher political and military levels. The result was a more distended decision loop and frustration amongst the military leaders, who were not able to fight effectively due to targets being untouchable and forces being publicly withheld from action.

In evolving to a higher level of battlefield integration, leaders at all levels must continue to understand and adapt to the emerging tools and not change some of the inherent principles of sound warfare leadership, namely Centralized Command and Decentralized Execution (CC-DE). NCW offers a valuable integration tool to all warfare leaders. The NCW technology merges fused information with weapon systems, the human operators, and leaders to create a more powerful capability to employ force efficiently. The result is a coherent common operating picture throughout the command hierarchy. Leaders must wisely implement this emerging technology throughout the chain of command, while ensuring that decisions concerning the execution of military force do not rise to higher echelons or political levels in the command hierarchy.

This paper will focus on the transformation being ushered in by NCW as related to the philosophy of CC-DE. After defining CC-DE, this paper will review issues affecting the command and leadership environment, discuss Information Operations (IO), draw on theoretical principles of NCW, and culminate by merging the NCW concept (technology) with the CC-DE (leadership) principle. Given that roadmap, this study poses six questions.



1. What is the role of CC-DE in an era of advanced information technology?
2. What are the strategic, operational, and tactical level implications of having a vast amount of information available, and what is the impact on obtaining knowledge from the quantity of information?
3. Will the knowledge gained through the NCW architecture enhance the application of force? If so, what is the impact on command leadership?
4. Will the higher echelon leaders take a closer hold on execution of operations and become more directive in the tactical applications of force?
5. What effect will increased timeliness of knowledge have on tactical commanders?
6. What are potential effects of NCW at the strategic, operational, and tactical levels of decision making?

## **CENTRALIZED COMMAND – DECENTRALIZED EXECUTION<sup>5</sup>**

Unity of effort is necessary for effectiveness and efficiency. Centralized planning is essential for controlling and coordinating the efforts of all available forces. Decentralized execution is essential to generate the tempo of operations required and to cope with the uncertainty, disorder, and fluidity of combat.<sup>6</sup>

In reviewing Air Force and Joint Doctrine, I found no real definition of the CC-DE philosophy. Perhaps that is because the definition differs depending on the level within the command hierarchy. CC-DE spans the decision making spectrum from the strategic to the operational staff and tactical levels. Although the “Command” element remains similar at all levels, “Execution” at one level is vastly different than execution at one of the other levels. The main theme of CC-DE is summarized in Air Force Doctrine Document 2: “Centralized control provides strategic focus while decentralized execution allows operational flexibility to meet

theater air component objectives... Decentralized execution permits the flexibility to maximize tactical success.”<sup>7</sup>

Before moving further into this idea of CC-DE at the various levels, a better understanding of the elements of CC-DE is required. What is meant by CC-DE? Defining the elements, Centralized and Decentralized, and Command and Execution, is the first step in gaining a deeper understanding of the philosophy.

- \* Centralized is defined as: “To bring under a single, central authority.”<sup>8</sup>

- \* Decentralized means: “To distribute the administrative functions or powers of (a central authority) among several local authorities.”<sup>9</sup>

- \* Command is defined as: “To direct with authority; give orders to. [or] To have control or authority over.”<sup>10</sup>

- \* Execution is: “The act of doing something successfully; using knowledge as distinguished from merely possessing it. [or] The act of accomplishing some aim or executing some order.”<sup>11</sup>

In a purely academic sense, Centralized Command (CC) is maintaining authority over a group while providing direction or giving orders on how to operate or function. Decentralized Execution (DE) is distributing authoritative power to various local authorities, allowing action based on current knowledge. The military translation in essence becomes a theory allowing combat decisions and actions to be made at the lowest possible level in a chain-of-command based on available knowledge of the situation, objectives, intent, and local intelligence.

CC-DE, as the hallmark of the Air Operations Center (AOC), relies on the foundation of knowledge gained through solid guidance, intent and objectives from higher authority, timely processing of available data into useable information, an understanding of the capabilities and limitations of the forces to be employed as well as the opposing forces, and knowledge of the operational environment. Knowledge and the requisite supporting information must be accurately communicated to all participating units operating within the theater and across the component forces. For CC to be effective, the command and control information network must be “interoperable, sustainable, and survivable... [to] ensure commanders [at all levels] receive mission-essential information, make informed and timely decisions, and communicate appropriate commands to subordinates...”<sup>12</sup> for planning and execution.

### CC-DE and Command Hierarchy (Strategic, Operational, Tactical)

As introduced at the beginning of this discussion, CC-DE is not a pure black and white concept. In fact, considering in technological advances, the idea of CC-DE is becoming a blurred vision because of the amount of information available at all levels, enhanced processing capability across command elements, and the speed at which information is exchanged. CC-DE is thus better defined as the relationship between the command elements interwoven with a blend of strategic, operational, and tactical theory to achieve effective application of force. Depending on the level of command, each leader will have a different perspective of CC-DE.

CC-DE at the strategic level spans the political and the highest military commands (Joint Staff and Combatant Commands) [refer to figure 1]. At this level, strategic planning and control center on how the military strategy

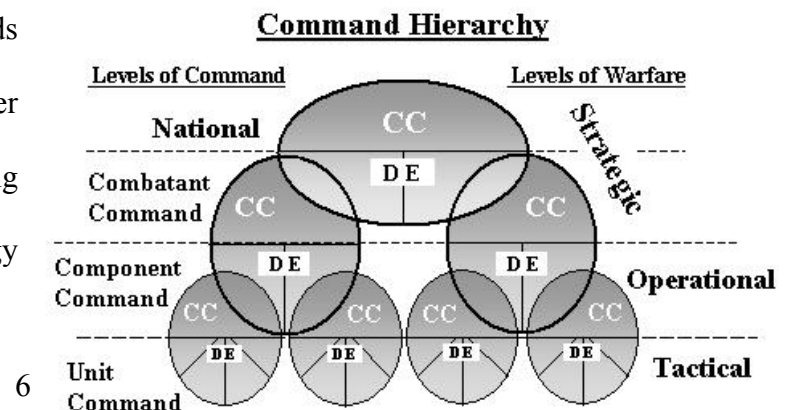


Figure 1

melds with the national or international strategy. The civilian leadership maintains CC, establishing the organizational structure and setting the overarching objectives related to the political, military, and socio-economic issues of a given region or conflict. The DE resides with the military leadership at the Joint Staff or Combatant Command level, translating the overarching strategy into military objectives, vision, and commander's intent. The execution may further be pushed down to the Joint Forces Command (JFC) level in the case of actual military conflict.

At the same time, the Combatant Commander or JFC maintains CC over the military forces, communicating strategic vision, guidance, and intent to the Component Commands (Air, Land, Sea and Special Forces), who then assume responsibility for the execution of the military operations.

The operational level, directed by the Joint or Service Component Commander as the lead agent, maintains CC responsibility, establishing component level guidance, intent, and the desired effects based objectives. The executor is the unit level commander or the specific mission commander who is charged with carrying out the tactical planning and execution to support the objectives. Simply stated, CC-DE becomes a pushdown effort of converting national strategy into military tactics to ultimately achieve effective employment of the military forces at each level in the chain of command.

### **Technology Impact on CC-DE**

Technology is forcing major changes in theater command and control dynamics. Global information networks and developments in weapons and platforms have significant impact on the conduct of military operations. No longer are the weapon systems required to be stationed "in

theater” to be employed. Various manned and unmanned aircraft and missiles deploy from distant locations while executing the combat plan.

As forces are spread beyond the theater, CC is essential for efficient use of the assets required for a given mission and to allow flexibility as the plan is executed. The concept of DE provides the unit level commanders and tacticians the responsibility for mission accomplishment with the caveat that “the on-scene [unit] commander must be free to exercise initiative based on his understanding of the situation and his knowledge of the [senior] commander’s intent.”<sup>13</sup> The unit commander is thus able to rapidly make decisions and influence the mission via an interoperable, sustainable, and survivable command and control network supporting CC-DE.

With advances in information technology, CC-DE at the strategic and operational levels allows for more efficient use of resources in executing the strategic vision. Through CC, military power can be harnessed and economies of scale achieved to enhance the application of force. Instead of each member of the team gathering data, and having a piece of a puzzle without knowledge of who has the other pieces, CC provides a focus on the whole puzzle followed by a parceling out of the pieces, orchestrating a cohesive effort and maximizing all potential strengths while minimizing the weaknesses of the team. DE then allows the combatants to maneuver as necessary to achieve the desired effects, placing their piece of the puzzle into place more efficiently.

There are many analogies that can be used to highlight the effects of CC-DE at the tactical level, but one of the better analogies is derived from a comment in a paper titled *Command and (Out of) Control: The Military Implications of Complexity Theory*, by John F. Schmitt. He discusses uncertainty in conflict by stating “uncertainty is a natural and unavoidable product of the dynamic war: action in war generates uncertainty.” CC-DE provides a stabilizing

force in the uncertainty principle. Schmitt continues his discussion by relating the ideas of uncertainty and control to a whitewater kayaker... “Is a kayaker paddling down a raging river really in control of the situation? Does he control the river? Does he really even control his own course?” The kayaker, like the warrior, must be constantly aware of the situation and react instinctively and with flexibility to the changing nature of the environment. Tying this concept into CC-DE, a group of kayakers, when approaching a larger rapid, will stop and “scout” the rapid from the bank, seeking to understand the dynamics of the rapid. As a group, the kayakers rely on the leader to determine the best course of action or the strategy for running the rapid, and interpret the nature of the rapid based on experience, knowledge, and information obtained by reading the river. However, once the kayakers return to the river and engage the rapid, the uncertainty principle sets in and each kayaker is forced to react to the dynamics of the river based on his own knowledge and skill to properly execute the tactics of navigating the rapid. While the leader may assist by providing some direction, the execution remains at the individual level. This analogy is similar to conflict. CC provides the vantage point to analyze and establish the best course for the component organization, but DE allows the unit level elements to act and react to the uncertainty and fluid nature of operations. As will be discussed later, NCW brings a new level of understanding to the situation, resulting in a greater ability to see through the uncertainty and navigate the rapids with increased clarity. But the kayaker is still responsible for safely navigating the rapids.

### **Communications in CC-DE**

To achieve effective CC-DE, communication is the most critical enabler. At the heart of command and control is communications, both horizontal and vertical. Effective communication establishes a common understanding to allow flexibility and execution of a mission.

Communication is based on three central pillars, the ability to transmit or convey data and information, the ability to receive timely data and information, and knowledge to allow full understanding of the data and information. Orders must be clearly transmitted and received, lower echelons must understand the desires of their superiors, and the leaders must understand the needs and intentions of their subordinates. Communication is the flow of information throughout the organization, establishing the knowledge required to maintain combat effectiveness.

The study of human nature or behavioral sciences reveals that there are many filters to effective communication. These filters tend to interfere with the information and cause various interpretations of a message. This in turn can have a degrading effect on CC-DE by destabilizing the foundation of trust and confidence throughout the command chain. If the commander's intentions are misunderstood and improperly executed, DE can quickly erode to Centralized Execution (CE), which may result in less flexibility and increased frustration throughout the organization.

### **Effective Leadership in CC-DE:**

The effectiveness of CC-DE is also directly related to the effectiveness of the leadership within the chain of command. Some attributes of an effective leader in a CC-DE environment are:

- \* An understanding of the roles leadership plays at each level in the command hierarchy.
- \* An in-depth understanding of the dynamics in a given situation, which includes knowledge injected from superiors, and information provided from subordinates and other command elements.

- \* An understanding of the role of each unit, and their associated capabilities and limitations.
- \* A firm understanding of the vision, objectives and guidance provided by higher authority.
- \* An understanding of the available information systems, and associated strengths, weaknesses, and vulnerabilities.
- \* Knowledge of doctrine and strategy to effectively employ the available forces.
- \* The ability to effectively communicate vertically and horizontally in the organization.
- \* An understanding of the specific level of conflict (whether total war or limited force employment).

Placing CC-DE in perspective, Joint Vision 2020 states:

... as new information technologies, systems, and procedures make the same detailed information available at all levels of the chain of command, leaders must understand the implications for decision-making processes, the training of decision makers at all levels, and organizational patterns and procedures. The potential for over centralization of control and the capacity for relatively junior leaders to make decisions with strategic impact are of particular importance.<sup>14</sup>

To illustrate the issue of CC-DE, in a recent lecture given at Air War College on the lessons being gathered from Operation Enduring Freedom, the briefer stated that we should “accept and understand centralized execution” as a result of limited conflict. Later in the briefing he showed a comparison slide on execution timelines (Find, Fix, Track, Target, Decide, Engage, and Assess (F2T2EA)<sup>15</sup>) depicting recent conflicts (see figure 2).<sup>16</sup> With the evolution



in technology and improved information systems, all blocks have shrunk over time, except the Decide block, which grew during Operation Allied Force (Kosovo), and Operation Enduring Freedom (Afghanistan). Why? Is this because of CE? CE can result in decisions being delayed while the “Staff” reviews the

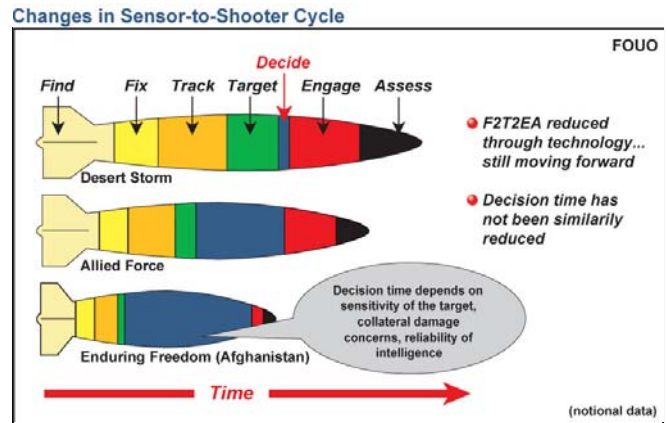


Figure 2

information, gathers additional information to support a decision, and checks to ensure there is no conflict. The result of CE can become a loss of strategic and operational situational awareness or a loss of focus. Given sound Commander’s intent and guidance, solid Rules Of Engagement (ROE) and well defined tasking, the need for CE should not be necessary. In the words of an Army brigadier general and an Army major:

There are three reasons for prudent delegation in a high-tempo environment. First, many discrete decisions must occur simultaneously at each echelon, and there is little hope that a commander can successfully cope with even a minority of them. Second, capabilities remain idle when the leader and staff reserve too many decisions for themselves. Finally, centralization risks belated action because new and unexpected information is not understood in time.<sup>17</sup>

The bottom line is, given political concerns in a limited conflict, the military organization will be forced into some level of CE at times, but this should be the exception. To be effective, leaders at the higher levels of command must understand the complexities of the internal political situation and effectively communicate throughout the chain to prevent CE from becoming the standard means of force execution. The idea of needless CE is highlighted in an observation from the battles in the Shahikot region during Operation Enduring Freedom in Afghanistan.

In March 2002, Predator drones provided... live pictures of ongoing combat operations as they evolved in Afghanistan. Though such images provided military commanders removed several thousand miles from the field with information and a first-hand, never before seen view of the battle, they also caused headaches for the commander of regular U.S. ground forces in Afghanistan who was overseeing the operation... [C]ommand personnel at higher levels, and operating in other locations, relayed numerous questions and much advice to the commander in the field in an attempt to contribute to the management of the battle as it unfolded.<sup>18</sup>

## **Achieving CC-DE**

If CC-DE as a concept is difficult to discuss and mold into a neat perspective, achieving CC-DE is even more difficult. The different personality traits of professional military leaders make CC-DE a challenge. Involvement in all aspects of a situation comes naturally for many leaders, but discipline is required to keep human nature in check by resisting the tendency to over-control or micro-manage a situation. Leaders prepare for success and rely on many “tools” to maintain a balance in leading and acting. Being educated on doctrine, understanding the guidelines that have been communicated in the guidance, intent, and objectives, given solid Rules of Engagement (ROE), and having pre-planned response options contribute to effective CC-DE.

Doctrine provides commands a reference from which to operate and allows the warfighter to keep the various information grids united and balanced. Doctrine defines the requirements and outlines the nature of the information networks and force structures, thus establishing a solid military foundation.

Understanding and communicating the commander’s guidance, intent, and objectives is essential to maintaining a firm foundation to achieve CC-DE. As data and information are acquired and sorted, leaders at the central command echelons must process the information into knowledge and pass that to the executor. Figure 3 depicts the Cognitive Hierarchy as discussed in the Doctrine for Command, Control Communications, and Computer (C4) Systems Support to

Joint Operations (Joint Pub 6).<sup>19</sup> Cognition results when the information is filtered through the doctrine, guidance, intent, and experience. The output of this process is knowledge. The central command authority is then able to make decisions and communicate the knowledge to the organization, potentially creating a deeper understanding of a given scenario and course of action.

When properly communicated and executed, ROE facilitates DE by supporting force application at the lowest echelon of command, including individual element decisions

on employing lethal force. ROE “are the means by which the National Command Authority and operational commanders regulate the use of armed force in the context of applicable political and military policy, and domestic and international law.”<sup>20</sup> ROE are essential building blocks to make decisions on the use of force at all levels of command.

In hand with ROE, pre-planned response options strengthen DE. Like a pilot who loses communication and relies on “lost comm” procedures to complete a mission, well developed and documented “lost comm” procedures for the use of force throughout the organization enhance mission accomplishment by maintaining effective CC-DE. Navy doctrine includes reliance on “preplanned responses” to minimize the risks inherent in warfare. These risks include such issues as the inability to communicate intentions to higher command authority in a timely manner (such as when confronted with a supersonic missile, or aircraft with certain flight characteristics), detecting unknown contacts rapidly closing the force; or when a delay in action may result in loss of life or place a unit in extremis.

## **Cognitive Hierarchy**

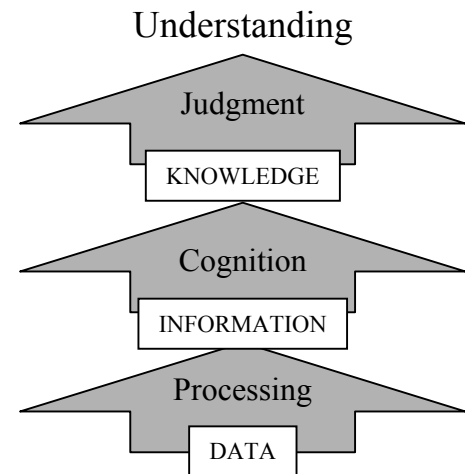


Figure 3

The Navy Composite Warfare Commander (CWC) doctrine has incorporated preplanned responses to allow individual commanders to execute operations, understanding that communications and timely information exchange may not allow them to obtain clearances from their superiors in certain circumstances. Having response plans ready allows for decentralized action, because each echelon knows and understands the role of the others and can therefore make and employ sound decisions. This is also a benefit when confronted with the fog of war or when information systems become unreliable. The risk inherent to preplanned responses is misinterpreting guidance and policy.<sup>21</sup> This risk is mitigated through adequate training, practical exercise and simulation, well defined guidance and intent, and a thorough understanding of ROE.

Vice Admiral Henry Mustin stated in his fighting orders to the U.S. Second Fleet:

The basic requirement of decentralized operations in general war is preplanned response in accordance with commonly understood doctrine. Lord Nelson did not win at Trafalgar because he had a great plan, although his plan was great. He won because his subordinate commanders thoroughly understood that plan and their place in it well in advance of planned execution. You must be prepared to take action... when certain conditions are met; you cannot anticipate minute-by-minute guidance...<sup>22</sup>

Finally, the theory of warfare supported by doctrine, guidance, intent, ROE, and preplanned responses is not enough to ensure effective CC-DE. Training is essential to fully understand all dimensions of CC-DE and to achieve victory. The entire organization must practice and train to achieve the desired results in warfare. Training and exercises enhance the warrior's understanding about the nature of war and enable the force to continue to fight when the fog of war sets in. Practicing CC-DE on a daily basis strengthens the foundation of command and establishes synchronization of the forces, providing the cornerstone to effective operations and assuring operational flexibility.

## **INFORMATION OPERATIONS**

Information Operations (IO) and information superiority have risen to a higher priority in the warfighting vocation and are essential elements to achieving a true Network Centric vision. Information is the linchpin for turning data into useable knowledge (refer back to Figure 2). With the ongoing evolution in technology and speed of data exchange, IO has become a force multiplier to the battlefield commander. As will be discussed in the next section on NCW, IO is the keystone in the NCW bridge supporting CC-DE.

IO is “the ability to support the commander with a fused, all-source, and real time presentation of the battlespace, while at the same time complicating the view of the battlespace for an adversary.”<sup>23</sup> IO improves “the commander’s capability to observe, orient, decide, and act faster and more effectively than the adversary...”<sup>24</sup>

### **IO Management**

Great strides have been made throughout the years to harness technology and the electromagnetic spectrum to enhance IO and provide real-time data to organizations. Various collection agents, sensors, and communication arrays allow data to be processed into useable information to enhance battlespace awareness and achieve a robust knowledge base.

Technological advances have also dynamically improved the ability to communicate across the theater and back to higher headquarters. Secure communications in voice and data networks, electronic mail, and messaging systems are commonplace. Data links that allow platforms to automatically report an abundance of information have been deployed. Information “grids” are overlaid, melding into common operating pictures, resulting in enhanced situational awareness by presenting a “global information grid (GIG).”

Information superiority, coupled with advanced technology, brings improved speed of information transfer, leading to an increased level of knowledge and thereby placing us inside the adversary's OODA loop. To ensure maximum benefit from IO, the data obtained must be accurate, relevant, timely, accessible, survivable, sustainable, and deployable. In other words, the IO "product must be responsive to the commanders needs."<sup>25</sup>

## **IO Vulnerability**

Information superiority offers vast improvements to achieve battlespace awareness, but there are limitations that must not be overlooked. IO relies on a robust network of nodes, interconnected by data lines rapidly exchanging data to facilitate enhanced information across the force. Vulnerabilities and risk still exist in the information architecture of today's systems. Protection of the data systems is a high priority, with redundancy and security interwoven at all levels to assure protection.

As communication and information systems have evolved, there has been a parallel evolution in countering and exploiting these systems from simple frequency jamming to intrusion into data systems and actual destruction of data by injecting viruses. The countermeasures and spy games to protect systems and take advantage of the adversary's systems are ongoing issues facing the intelligence community.

The principles of the 5 Ds (disrupt, deny, degrade, destroy, or deceive)<sup>26</sup> are essential elements in the information warfare strategy, just as in any warfare discipline. The adversary is focused on disrupting the integrated network and will attempt to attack each node. Intrusion, deception, denial of service, as well as disinformation and system failure, are all vulnerabilities faced by modern network system operators. Vice Admiral Cebrowski has stated,

[N]etworks are very robust... alternate routings, self-repairs, and rapid reconstitution tend to be characteristic of good networks. Beyond the

structure of the network, operation of the network by knowledgeable professionals provides the other ingredient of robustness. The key, and the rub, here is to ensure that one's networks are, in fact, both carefully designed and skillfully operated.<sup>27</sup>

Leaders in the IO arena continually seek ways to protect all elements of the information spectrum. In addition to built-in network defenses, a defense in depth philosophy prevails to ensure the information infrastructure remains adequately protected. Multiple access control algorithms help maintain security and provide information assurance throughout the military. Encrypting data remains a basic tenant to security, and through enhanced processing algorithms and hardware “keys,” data is somewhat safe from exploitation. Frequency agile systems strive to stay ahead of intruders. Systems such as TADIL J (Link 16) and CEC (Cooperative Engagement Capability) provide enhanced processing and exponentially greater security while offering faster data transfer and more reliable synchronization across platforms. In addition to other countermeasures, time-based and waveform technology also enhance security.

The “choke points” or nodes where information funnels into one location, whether ground relay station or satellite, are hardened against certain types of attack and outfitted with intruder detection capability. Redundancies are being engineered into the NCW architecture to ensure data is available to all participants, and communication centers have preplanned response procedures to enable other sites to pick up the “load” if they become incapacitated.

Even more threatening than the interruption to the information flow is a disparity in technology between users. Despite the explosion in communication and information technology, there remains a chasm across the armed forces for access to the new technology systems. Simply stated, there is not enough time, money, or equipment in production to outfit all units and keep everyone current with modern systems. The gulf between modern and dated systems continues to grow, leading to difficulties maintaining a common operating picture across the battlespace.

For example, the Navy currently is operating with battle groups that are still not fully TADIL J equipped. TADIL J has been operational since 1996; yet there remains a mismatch between assets. Some elements of a battle group continue to rely on older radio systems and TADIL A (Link 11) for primary information exchange, while other elements employ TADIL J and even CEC. Because of this mismatch, some relevant information is not pushed to the control center; instead the information must be pulled by the control centers to establish a more coherent picture. This process is inefficient and frustrating to the warfighters who need to make rapid decisions. The systems disparity exacerbates the fog of war and introduces friction in employing force. The future portends great achievements in automated integration of data, but if there is a lag in equipping the forces or processing the vast amount of information, how effective is this technology?

## **Network Centric Warfare**

*Continual change and the need to respond to it compels the commander to carry the whole intellectual apparatus of his knowledge with him. He must always be ready to bring forth the appropriate decision. By total assimilation with his mind and life, the commander's knowledge must be transformed into capability.*

—Carl von Clausewitz  
*On War*

Clausewitz understood that knowledge is essential to timely decision making, which translates into effective application of force to achieve victory. In this regard he presaged the effect of NCW, which is in essence elevating the last sentence of his quote above to a new level of warfare.



## **The NCW Concept**

But what is this NCW concept? NCW has emerged over the past 15 years as a concept to explain the synergy of bringing information systems, sensors, weapon systems, command elements, and the human operators together to produce a coherent, stable and precise vehicle for taking the punch to the enemy while maintaining a strong defense. NCW creates superior situational awareness through the overlay of “three NCW grids--the sensor grid, the command and control or information grid, and the engagement or shooter grid – [which] combine to enable rapid, precise offensive and defensive action.”<sup>28</sup> NCW then is best described as a tool to enhance operations by elevating weapons employment beyond a specific platform.

NCW enables platforms to share precise information in real time to allow full use of the array of weapons in a given theater. At the same time, NCW provides information superiority and the capability to see and better understand the larger operational picture. As a result, leaders are able to more rapidly align the larger combat vision and decide upon courses of action as events unfold. “The bottom line is a shared image of the battlespace between joint decision makers and warfighters at all levels with instantaneous sensor to shooter connectivity.”<sup>29</sup>

However, the NCW concept is not a means of enabling autonomous warfare. “To operate in a network-centric environment is not an objective or a goal of combat. Likewise, to operate network-centrally is not a strategy for conducting combat. Rather, network-centric warfare is a tool...”<sup>30</sup> By providing a greater fusion of information, NCW brings about a more rapid synthesis of knowledge. In turn, this knowledge is seamlessly integrated with existing platform capabilities allowing for more rapid decisions, enhanced targeting and greater flexibility in prosecuting the mission.

NCW has the potential to unite all aspects of the military into a seamless entity which will allow victory through precise and effective force employment, enhanced force protection,

and reduced fog and friction of war. The strength of the NCW concept relies on a trust that the information is timely, reliable, relevant, accurate, and readily available to all participants to achieve effective decentralized operations.

### **NCW Limitations**

While NCW operations provide early warning and weapon systems integration, which allows efficient employment of weapons, there are several issues that interfere with true NCW application. In addition to the prior discussion of vulnerabilities to IO, any network arrangement is subject to breakdown, and as the network becomes more complex and distributed, it becomes more vulnerable or fragile.<sup>31</sup> In recognizing the risk of over-dependence on the tools, the ability to operate independently (or at a platform centric level) must be maintained and practiced. While redundancy and security of the network are being addressed in establishing the NCW construct, the warfighters must continue to train to function in a non-NCW environment.

Technology also continues to outpace the ability of the average operator and leader to master the complexities of new systems. As is demonstrated daily, technology can be frustrating as commands strive to keep pace with the changes. Few will deny the virtues of advanced technology in processing information and conducting operations, but many will also voice frustration with the ability to efficiently use the technology. Software changes and introduction of new tools with no training frustrate operators. Office networks continue to fail and email accounts become overloaded. Weapon systems bog down or become interrupted due to faulty encryption, failure of sub-systems, or unexpected faults in the programming. Interoperability challenges emerge during joint exercises and force deployments, and deficiencies hinder coalition interoperability, creating frustration and degrading effective force employment. Navy

doctrine attempts to maintain a proper focus on these issues by distinguishing between command and control processes and systems.

We must make an important distinction between the process of command and control and the system that supports it – the process is more important than the system... uncertainty is inherent... and will never be eliminated altogether... professional leadership, realistic training, flexibility, and cohesive doctrine will all help the commander cope with uncertainty.<sup>32</sup>

Understanding that NCW provides for more effective use of the military by taking advantage of advanced technology, the issue of disparity in capability again rises as a limitation in NCW development. Parallel to the discussion of information systems disparity, an even greater disparity arises between the U.S. forces and coalition forces with whom we operate. Over the past decade there has been a continual shifting in the coalition force structure, depending on the conflict. Coalition nations do not possess the same resources and integrated systems as the U.S. and other allies. Even amongst our closest allies, there remains a division in interoperability. As the NCW concept moves forward, what becomes of those who cannot afford to keep pace? The security implications surrounding the use of NCW architecture present additional challenges to effective coalition operations.

The “have” vs. “have-nots” is a tough issue. At the strategic level there is risk of dividing the coalition forces. What effect does this division have on executing the mission? Classical strategists like Sun T’zu, Jomini, Mahan, and Clausewitz caution on the division of forces and, in fact, call on an army to divide the opposition to assure victory. As Clausewitz stated, “...there is no higher and simpler law of strategy than that of *keeping one’s forces concentrated*. No force should ever be detached from the main body unless the need is definite and *urgent*.”<sup>33</sup> While the inherent meaning of division of forces has changed over time, Clausewitz’ implication to the strategic effect of keeping forces concentrated still applies in conflict today. Evolving to a separate plain of warfighting as a result of Network Centric

operations and advances in technology creates the potential for dividing coalition and allied forces, and brings a risk of losing a conflict.

The asymmetric application of arms fostered by an NCW environment allows a division of forces in technological warfare. However, basic communication with those on the other side of the technology gulf is of greater importance to maintain a “concentrated” force. As witnessed during Operation Allied Force, separate Air Tasking Orders were used for NATO and special U.S.-only forces. This led to some interoperability problems and command level friction at the Combatant Command and Component Command levels. Active communication, honest leadership, and a respect between the various NATO members helped minimize the frustration caused by the technology gulf and underlying security issues.<sup>34</sup>

On the other side of the issue of dissimilar technology, Operation Enduring Freedom has shown that successful operations alongside warriors with less advanced systems are possible. In scenes reminiscent of the Wild West, Special Forces rode into harms way on horses and camels, effectively blending limited capabilities with advanced systems to accomplish the mission. Again there was an understanding and trust between the coalition forces, which made the arrangement work.

### **NCW Related to CC-DE**

The NCW concept spans all levels of the military and must be understood by all leaders to maintain effective CC-DE. The strategic level leaders are provided with a more focused operational picture, which helps them formulate and revise strategy and communicate a clearer vision. NCW allows the operational-level leaders to better understand the effects the forces are having in theater. Hence, they can make better operational decisions and more effectively influence the campaign plans of their superiors, while ensuring that the subordinate units are

effectively employed and more fully understand their roles. At the tactical level, NCW provides a more effective tool to execute the mission and to communicate the battlefield picture to higher authority and across components. This sharing of knowledge saves time and reduces frustration by delivering a more coherent understanding of the battlespace throughout the entire organization while optimizing weapon employment and maximizing the use of force.

While NCW advances IO and supports CC-DE at all levels in the organization, when the information sub-systems are mismanaged, or when the overall perspective of the conflict is lost, strategic and operational leadership can easily degrade to a tactical level as the leader becomes overloaded with too much information. The result can be frustration throughout the command with severe repercussions at the tactical level of execution.

Additionally, having real-time access to tactical information at the higher headquarters level is desirable, but it can have a detrimental effect at the strategic and operational levels, resulting in micro-management of tactical execution. General Michael Short painted a worthwhile example during a discussion at the AFA National Symposium 2000. He told of one of his experiences as JFACC during the Operation Allied Force, which demonstrated some aspects of early NCW applications.

About 45 days into the war, ... we had live Predator video of three tanks moving down the road in Serbia and Kosovo... We had a FAC [Forward Air Controller] overhead and General Clark [SACEUR] had the same live Predator video that I had. "Mike, I want you to kill those tanks." I quickly responded... "Boss, I'll go after that for you." ... We had a weapon school graduate on the phone talking direction to the FAC on the radio. Call went something like this: 'A lot of interest in killing those tanks, 421. I'd like you to work on it.' 'Roger.' Two or three minutes went by, and 421 clearly had not found those tanks. The young major's voice went up a bit and said, 'ComAirSouth, and SACEUR are real interested in killing those tanks. Have you got them yet?' 'Negative.' About two more minutes went by and the weapons school graduate played his last card. 'General Short really wants those tanks killed.' And a voice came back that I've heard in my house for the better part of 30 years and he said, '[expletive deleted], Dad, I can't see the [expletive deleted] tanks!'"

This incident illustrates the need for higher echelon commands to be cautious about micro-managing execution of a conflict. Not having been at SACEUR Headquarters, nor the CAOC, nor in the A-10 executing this search and destroy mission, I can only theorize that there was much attention centered on this one event. Because of the video feed and the real-time, live action transmission of the target, the warfighters at the strategic and operational levels may have been pulled into a tactical level execution. The fact the “Generals” were watching perhaps caused the JFACC operator to introduce a higher sense of urgency into the attack, and subsequently the pilot became more pressured and frustrated, as demonstrated by his reported retort to General Short. The question pertaining to this case is: Was the control agent (the JFACC controller) providing the executor (FAC) with the information necessary to carry out the mission? If the controlling agent effectively communicates the desired action to the executor, the executor should be allowed to carry out the mission without interruption, unless the mission changes or runs afoul. This is a common tenet of air control. If the executor is unable to attain the objective, he should seek additional guidance or proceed to a secondary objective. With greater situational awareness offered by NCW, the command element may determine the mission is misdirected and additional information may be provided to manage the situation. Micro-management of mission execution should be the exception because it blurs the line of responsibility and tends to add excess stress to already stressful job.

There are other similar lessons throughout history of a narrowing of focus and a tendency of leaders to “get into the cockpit” as the intensity of conflict rises. With NCW the risk of this interference is greater. Human nature tends to override recent training, and individuals fall back on past experience to guide them as the “adrenaline kicks in.” The senior military leader has generally spent the majority of a career operating at the tactical level. With approximately 16-18

years of tactical level experience and perhaps a 3-5 year overlap with operational level experience, the mind is trained to react and is relatively comfortable operating in the tactical environment. As the leader moves into the operational and strategic levels of warfare, the foundation of knowledge and instinctual reactions to a situation can become less comfortable, and the tactical background starts to push forward, influencing decisions.

Additionally, as technology matures and large amounts of real-time “tactical” information become the standard at higher headquarters levels, the commanders risk being pulled into the tactical engagements. The risk to the campaign when this occurs is loss of operational and strategic situational awareness. Even at the tactical level, I have seen mission commanders involved in Command and Control be pulled into specific engagements and lose the larger battlefield perspective, resulting in degradation of situational awareness, which in essence opens an avenue for the enemy to get through and land a punch.

In evolving to the NCW concept, the CC-DE relationship becomes more synergistic and has the potential to significantly enhance force application decisions between the various command levels. The example just cited can be used to illustrate the advantages of NCW when applied to CC-DE. Given the predator video feed, the Combatant Commander was able to make a split second decision to attack a tank column, which was suddenly discovered. The result was quick tasking of an asset to attack the tanks. In past conflicts, the F2T2EA may have resulted in a time delay and possibly a missed opportunity to attack the tank column while information was exchanged.

In future conflicts, the scenario can result in an even tighter targeting loop. Imagine the video feeding into the JFC and JFACC command and to a strike package on routine patrol. The strike lead, seeing the tank column, relays his intention to commit the strike package to attack.

The strike leader, having knowledge of the commander's guidance and intent, and ROE, coupled with specific mission tasking and the precise target location, immediately directs attack via a salvo of missiles (which have also received the exact coordinates along with information on the tank movement to allow precise targeting). The strike package then follows up with a clean-up effort because the video shows two of the three tanks being hit, but the third still maneuvering. Imagine all this occurring in less time than it took to read this paragraph. NCW theoretically provides such capability while supporting the CC-DE philosophy.

In this illustration, the central aviation command authority was able to see the specific tactical picture and maintain operational situational awareness but did not need to specifically direct an attack. The strike package executed the mission by being proactive, based on understanding the situation while providing the quality assurance to ensure the mission was properly executed and completed. There was no reason for the higher echelons to micro-manage because they could monitor the events unfolding. "As we apply the concepts of NCW to the 'management' of battlespace information, we can expect that ...everyone will be more knowledgeable about the battlespace."<sup>36</sup> Thus, tactical-level operators have a greater understanding of the events, can make recommendations, and take quicker action, thereby enhancing execution of strategy and operational effects. The Navy has executed under a similar construct known as "Command by Negation," which is the essence of "Decentralized Execution." Both philosophies are fully supported by the NCW concept and can bring about desired effects by achieving asymmetric use of force.



## CONCLUSION

*Without care in organizing a system, it could let every level of command interfere with those trying to conduct the battle... “If you build a system set up to let the Secretary of Defense, the Chairman of the JCS, the J-3 and the National Security Advisor get involved, it would cause great confusion. You would undercut the authority of the commanders who fight the war. Remember, the first fight they had over Predator was about who could tell it where to look and with which sensors. The doctrine needs to state who's in command.”<sup>37</sup>*

Anonymous USAF Officer

CC-DE establishes the command philosophy to allow efficient use of force, making victory on the battlefield more likely. IO allows the vast amount of information available, as a result of advances in technology, to be processed into knowledge. NCW offers leaders full spectrum domination of the battlespace by integrating information and knowledge with weapon systems capabilities to apply asymmetric force in conflict.

While NCW brings a transformation in the form of synchronized application of force, the leaders remain the key to managing this tool. The leaders at all levels in the command hierarchy must have a firm understanding of the capabilities and the risks associated with the technology. They must understand that the fused Common Operating Picture, providing tactical level relief, has different application at the strategic, operational, and tactical levels. They must recognize that too much involvement (micro-management) can lead to reduced efficiency and loss of flexibility, as well as obstructive filters to communication.

NCW and IO are complex tools, and like any complex tool, they can incapacitate the operator who lacks the thorough knowledge and understanding to wield them effectively. The incapacitation can come in the form of strangled command relationships, loss of full battlespace awareness, or miscommunication resulting from overload and over-reliance on a given system. Care must be taken to ensure this transformation in technology does not erode CC-DE.

To effectively incorporate the NCW concept into the CC-DE environment, devoted education and training across the command hierarchy is essential. This education must emphasize the proper functions and application of available technology as related to the strategic, operational, and tactical warfighting levels. Training should highlight the effects NCW can have on operations and illustrate the implications of using the available information to make tactical decisions at the operational and strategic levels.

NCW offers the higher echelons the ability to centrally execute operations; this must be the exceptional case. As leaders at the higher echelon are fed the real time tactical level information, they must keep in mind that they are training the future leaders. Therefore, they need to let those future leaders command and execute at the tactical-level. The leaders at strategic and operational levels need to exert discipline to keep human nature in check and not fall back to running the show at the tactical level, thereby maintaining battlefield situational awareness and using the tactical information to create a more focused vision of operations and strategy.

At the tactical level, the operators and leaders must understand the effects of NCW throughout the command hierarchy. NCW doesn't give a green light to execute immediately. There are times when execution must be controlled and limited. NCW infused throughout the chain allows for better control and execution. The operators need to understand the relationship between strategy and tactics and trust their commanders to effectively employ the tools of war.

As the political leadership and military commanders struggle to adapt to the transformation being ushered in by NCW, the most important lesson learned through the ages must be kept in mind. Human nature, psychology, and communications are essential elements in the application of power. The human element is the most difficult aspect of effectively

integrating technological advances. Education, training, practical experience, and trust in each other will allow safe navigation through the uncertainty of the whitewater rapids of modern warfare.

*The overarching focus of [Joint Vision 2020] is full spectrum dominance – achieved through the interdependent application of dominant maneuver, precision engagement, focused logistics, and full dimensional protection. Attaining that goal requires the steady infusion of new technology and modernization and replacement of equipment. However, material superiority alone is not sufficient. Of greater importance is the development of doctrine, organizations, training and education, leaders, and people that effectively take advantage of the technology.*

Joint Vision 2020<sup>38</sup>

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<sup>1</sup> John R. Boyd, “The Essence of Winning and Losing,” *briefing*, 28 June 1995 (rev January 1996), 5, on-line, Internet, 27 September 2002, available from [http://www.belisarius.com/modern\\_business\\_strategy/boyd/essence/eowl\\_frameset.htm](http://www.belisarius.com/modern_business_strategy/boyd/essence/eowl_frameset.htm).

<sup>2</sup> Navy Warfare Publication (NWP) 3-56, Revision A, *Composite Warfare Commander's Manual*, 01 August 2001, 2-2.

<sup>3</sup> Air Force Doctrine Document (AFDD) 2, *Organization and Employment of Aerospace Power*, 17 February 2000, 6.

<sup>4</sup> The events of the Task Force Ranger incident are summarized in *Somalia Operations: Lessons Learned*. Kenneth Allard, *Somolia Operations: Lessons Learned*, (Washington, D.C.: NDU Press, 1995), 58-59.

<sup>5</sup> Air Force Doctrine Document (AFDD) 2-8, *Command and Control*, 16 February 2001, 5.

<sup>6</sup> Joint Publication 3-56.1, *Command and Control of Joint Air Operations*, 14 November 1994, V.

<sup>7</sup> AFDD 2, 6.

<sup>8</sup> *The American Heritage Dictionary of the English Language*, 4th Ed. (Houghton Mifflin Company, 2000), n.p., on-line, Internet, 24 October 2002, available from <http://www.dictionary.com/search?q=Execution>.

<sup>9</sup> Ibid.

<sup>10</sup> Ibid.

<sup>11</sup> *WordNet 1.6*, (Princeton, N.J.: Princeton University Press, 1997), n.p., on-line, Internet, 24 October 2002, available from <http://www.dictionary.com/search?q=Execution>.

<sup>12</sup> AFDD 2, 18.

<sup>13</sup> Naval Doctrine Publication (NDP) 6, *Naval Command and Control*, 19 May 1995, 54.

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<sup>14</sup> Chairman, Joint Chiefs of Staff, *Joint Vision 2020*, June 2000, n.p., on-line, Internet, 15 August 2002, available from <http://www.dtic.mil/jv2020/jvpub2.htm>, text only version.

<sup>15</sup> Handout 257, *Time-Critical Targeting Functionality (TCTF)*, Air War College Command and Control of Airpower Elective, June 2002, 5.

<sup>16</sup> Col Fred Wieners, "Operation Enduring Freedom Preliminary Lessons," lecture, Air War College, Maxwell Air Force Base, AL, 25 October 2002.

<sup>17</sup> Brigadier General Huba Wass de Czege, US Army, Retired, and Major Jacob Biever, US Army, "Optimizing Future Battle Command Technologies Optimizing Future Battle Command Technologies," *Military Review*, March/April 1998, n.p., on-line, Internet, 4 Sep 02, available from <http://www-cgsc.army.mil/milrev/English/MarApr98/czege.htm>.

<sup>18</sup> Anthony H. Cordesman, *The Lessons of Afghanistan: Warfighting, Intelligence, Force Transformation, Counterproliferation, and Arms Control*, (Washington, DC.: Center for Strategic and International Studies, August 12, 2002), n.p., on-line, Internet, 23 November 2002, available from <http://www.csis.org/burke/sa/lessonsofghanistan.pdf>.

<sup>19</sup> Joint Publication 6, *Doctrine for Command, Control, Communications, and Computer (C4) Systems Support to Joint Operations*, 30 May 1995, I-4.

<sup>20</sup> Handout 243, *Rules of Engagement*, Air War College Command and Control of Airpower Elective, June 2002.

<sup>21</sup> NWP 3-56, 2-8.

<sup>22</sup> Quoted in NDP 6, 56.

<sup>23</sup> Air Force Doctrine Document 2-5 (AFDD 2-5), *Information Operations*, 04 January 2002, 1.

<sup>24</sup> Ibid.

<sup>25</sup> Air Force Doctrine Document 2-5.2 (AFDD 2-5.2), *Intelligence, Surveillance, and Reconnaissance Operations*, 21 April 1999, 9.

<sup>26</sup> The 5 Ds are fully discussed in AFDD 2-5, 7.

<sup>27</sup> Vice Admiral Arthur K Cebrowski, "Network-centric Warfare: An Emerging Military Response to the Information Age," *presentation at the 1999 Command and Control Research and Technology Symposium*, 29 June 1999, n.p., on-line, Internet, 02 September 2002, available from [http://www.nwc.navy.mil/pres/speeches/ccrp2\\_.htm](http://www.nwc.navy.mil/pres/speeches/ccrp2_.htm).

<sup>28</sup> Ibid.

<sup>29</sup> Joint Pub 6, II-13.

<sup>30</sup> Cebrowski.

<sup>31</sup> Ibid.

<sup>32</sup> Underline added for emphasis. NDP 6, 66.

<sup>33</sup> Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, NJ.: Princeton University Press, 1976), 204.

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<sup>34</sup> The issue of different ATOs was addressed by a retired Air Force General during the Command and Control of Airpower Elective Seminar in September 2002.

<sup>35</sup> Handout 257, *Time-Critical Targeting Functionality (TCTF)*, Air War College Command and Control of Airpower Elective, June 2002, 5.

<sup>36</sup> Davis S. Alberts, John J. Garstka, and Frederick P. Stein, *Network Centric Warfare: Developing and Leveraging Information Superiority* (Washington D.C.: CCRP Publication Series, 1999),104.

<sup>37</sup> David A. Fulghum, "Rumsfeld Pushes Network Warfare," *Aviation Week & Space Technology*, November 11, 2002,32, on-line, Internet, available from <http://ebird.dtic.mil/Nov2002/e20021111pushes.htm>.

<sup>38</sup> Chairman, Joint Chiefs of Staff.

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